earlier. In addition to molecular-beam experiments, a summary of radioöptical (optical pumping) and microwave absorption experiments is given.

The articles by Klaus Ziock on the lifetime of excited states and by Charles W. Drake on polarized-ion sources are fairly complete (as of 1966) reviews.

A brief section on basic techniques features articles on ultrahigh vacuum and methods of gas purifications, by G. E. Becker and R. M. Mobley, respectively. This appears to be the only part of the book that is concerned with methods, per se.

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Algebra of rotation

LIE THEORY AND SPECIAL FUNCTIONS. Willard Miller, Jr. 338 pp. Academic Press, New York, 1968. $16.50

by HENRY S. VALK

In 1951 L. Infeld and T. E. Hull, in a paper in the *Reviews of Modern Physics* 23, 21 pointed out that particular classes of second-order differential operators could be factorized into the product of two first-order differential operators, and that these first-order operators could, in turn, give rise to recurrence relations connecting different eigenfunctions of the original second-order differential equation. The most common use of this procedure occurs in constructing eigenfunctions of the angular-momentum operator. In this case the second-order operator $\mathbf{L}^2$ is expressed in terms of raising and lowering operators L_+ and L_-, and the z component of the angular momentum, L_z and the algebraic properties of these operators are then utilized to derive the desired results. At a time when the *gruppenpest* is rampant, most physicists will recognize that these algebraic properties follow from the fact that the operators L_+, L_- and L_z form a representation of the Lie algebra of the rotation group. Less well known, however, is that the commutation relations of Lie algebras can be used in a general fashion to obtain recursion relations, generating functions and addition theorems for most of the common special functions of mathematical physics. It is this second approach to special-function theory that is the subject of the book, *Lie Theory and Special Functions.* The current work is a direct outgrowth of an earlier memoir by the same author (*Memoirs of the American Mathematical Society*, no. 50, 1964), but expanded and redirected so as to be more accessible to an audience of physicists. In his preface the author, a mathematician from the University of Minnesota, expresses the hope that his book will help to bridge the gap between the pure and applied sciences. In my opinion, Miller has succeeded admirably. Any graduate student with a reasonable background in theoretical physics should find most of the book self-contained. The requisite mathematical concepts and results of Lie theory are surveyed in the first two chapters. The remainder of the book is concerned with developing a unified approach to the special functions within the context of Lie theory. The elegance of this approach will put the book on the required list of those readers who harbor an affection for the special functions; however, the volume makes valuable reading for any physicist, as it again demonstrates very clearly the intimate relationship that exists between the mathematical description of a physical problem and the symmetry that may be inherent in the problem.

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Survey of great experiments

MUONS. By A. W. Weissenberg. (Trans. from Russian). 347 pp. North-Holland, Amsterdam (Interscience, New York), 1967. $19.50

by JOHN L. GAMMEL

This book is a translation of a book that was first published in the Russian language in 1964. It is mainly about experimental physics: Experimental apparatus and results are described in great detail. It is also historical in character: Early experiments and their results are treated in as much detail as the experiments that superseded them. The experiments described (such as that of Chien-Shiung Wu, Ernest Ambler, Raymond Hayward, Dale Hoppes and R. P. Hudson, which first exhibited nonconservation of parity; that of Richard Garwin, Leon Lederman and Marcel Weinrich that exhibited nonconservation of parity in π-μ-e decay and resulted in the first experimental values of the magnetic moment of the muon; that of G. Charpak, F. J. M. Farley, Richard Garwin, T. Muller, J. C. Sens, Valentine Telegdi and A. Zichichi, which resulted in a precision value of the magnetic moment of the muon; that of G. T. Danby, J. M. Gaillard, K. Goulianos, Lederman, Nariman B. Mistry, Melvin Schwartz and Jack Steinberger, which first verified the two-neutrino hypothesis—and more) are comparable in importance to either experiments that revolutionized the conceptual basis of physics, such as the Michelson–Morley experiment, or great precision measurements, such as Robert A. Millikan's measurement of the charge on the electron. These research teams do not produce books like Arthur Compton's *X-Rays in Theory and Experiment*, or Ernest Rutherford, James Chadwick and Cecil Ellis's *Radiations from Radioactive Substances.* This book fills the gap that results. I view this book—as I view these other books—as historical documents that are not without merit as scientific treatises at any later date however remote. Like these other books, it might serve as a reference book for undergraduate surveys of great experiments.

It is possible to find fault with the book. This process may be begun by comparing it with a book edited by T. D. Lee entitled *Weak Interactions and High-Energy Neutrino Physics,* (Proceedings of the International School of Physics "Enrico Fermi", Varenna, Italy, course 32, 1964, Academic Press, New York, 1966). The description of experiments (γ_μ + heavy nucleus $\rightarrow \mu^- + e^+ + \gamma_e$ + heavy nucleus) that lead to the conclusion that the mass of the intermediate boson—if it exists—is greater than 2 Bev is mentioned on page 120 of Weissenberg's book, but no real account of them appears anywhere in the book—certainly not in Chapter I as asserted on page 120. Gilberto Bernardini describes the experiments in great detail in Lee's book, as does Lee himself but more sketchily.

From the theoretical side, this book is certainly much weaker than Lee's and at times appears wrong. (I do not understand the statement on page 88 that "No information is available at present about the absolute probability of these processes" ($\pi \rightarrow \mu$ +